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Spectroscopic monitoring of V1357 Cyg = Cyg X-1 in 2002-2004

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Abstract

We discuss the results of optical spectroscopic monitoring of Cyg X-1 = HDE 226868/V1357 Cyg in 2002-2004. Our spectroscopy was carried out at the Terskol Observatory (Kabarda-Balkaria, Russia; the resolving power was R = 45 000 and 13 000) and at the Bohyunsan Optical Astronomy Observatory (BOAO, Korea, R = 30 000 and 44 000). Each spectrum covers most of the optical range. We obtained a total of 75 echelle spectra on 33 nights, during both "soft" and "hard" X-ray states of Cyg X-1. We study the influence of the X-rays on spectral-line profiles using RXTE/ASM X-ray data. We find that the X-ray flare of June 13, 2003 resulted in strong variations of the emission profiles of the Hα and HeIIλ4686 Å lines within a night. This behavior is due to variations of the ionization state of the gas in the system. We also analyzed line-profile variations with orbital phase. A spectral atlas of Cyg X-1 was created, and the lines it contains identified. A total of 172 stellar lines and blends belonging to 12 chemical elements (H, He, C, N, O, Ne, Mg, Al, Si, S, Fe, Zn) were identified. The spectral classification of HDE 226868 as an ON star is confirmed.

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